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ABSTRACT

A fertile area for the improvement of mathematics achievement in the United States is in staff development for multicultural education. Multicultural mathematics is best defined by what it is not; it is not ethnomathematics, nor simply Afrocentrism or Eurocentrism. Multicultural mathematics furthers the multicultural goals of the school system because it shows minority students that all social groups have contributed to the body of knowledge they learn in mathematics class. Preservice education for teachers is the best opportunity to introduce a multicultural perspective on mathematics. Multicultural mathematics education should be taught in inservice programs as well. Regardless of the depth of instruction necessary to acquaint teachers with multicultural mathematics, the important ingredient is a commitment to inclusion. Problem solving in mathematics provides an opportunity to pose problems from many cultures that highlight many social groups. National standards efforts do not always address multicultural approaches directly, but they do encourage the inclusion of all cultures. Inservice education offerings must also be locally relevant, with emphasis on the cultural groups served. (SLD)

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Staff Development for Multicultural Education in Mathematics

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Staff Development for Multicultural Education in Mathematics

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Working Group 6: Pre-service and in-service teacher education
Chief Organizer: John A. Dossey
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The setting

There are many places for us educators in the United States to lay the blame for less than stellar performances of our a large number of our mathematics students. Over the past few years we have more closely examined the achievement of the component groups we serve. The results have been disquieting, if not surprising. When we disaggregate our data, we more clearly see that as we have attempted to close the gap between the achieving majority and the underachieving minority students, we have, by and large, failed. We have, in some instances, managed to sacrifice some excellence in the quest for equity. Our goal, as we move toward the twenty-first century, should be to restore the excellence which has been the hallmark of the United States education system, while affording all of our students an equal chance at successful participation in that system.

A common explanation of the gap in achievement between the groups is that race and ethnicity are simply the most obvious features of the lower achieving group, when socioeconomic status should be noted as the true discriminator. In an earlier talk at this conference, Professor Uri Treisman reminded us that such arguments have been advanced at least since the 1960s, and they were found just as lacking at that time. Upon further disaggregating the disaggregated data, however, we note that when holding socioeconomic status constant, there is still a difference in achievement by race. Poor white kids do better than poor black kids; rich white kids do better than rich black kids, and so on. Unless educators are willing to interpret that data as proof that some races are better at mathematical thinking than others, then we must examine our practices and our beliefs as they relate to mathematics and mathematics education. One fertile area for such work is that of multicultural mathematics.

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The "definition"

It's not uncommon for me to be asked "What does 'multicultural mathematics' mean as it is used in a public school setting (in the United States)?" Rather than to

attempt to define it, and perhaps alienate those with a narrow definition, I choose rather to answer what multicultural mathematics is not, and what it can do.

- It is not ethnomathematics, but it should make good use of the work in ethnomathematics.
- It is neither Afrocentrism nor Eurocentrism yet must study and balance the work done in either mode.
- It does further the multicultural goals of our school district, as should all curricular areas.
- It gives all students a better understanding of the mathematics they are learning and where it comes from.
- In a district such as my own, where the disaggregated data shows a differentiation of mathematics enrollment and achievement, by race, it offers one means for closing that gap. It shows minortiy students that all social groups, including the ones from which they have descended or to which they currently belong, have contributed to the body of knowledge they are learning in mathematics class.

The challenge

Remember Eric Von Daniken? Over the last 15 or 20 years, such books of his, as Chariots of the Gods and Pathways to the Gods have told of Von Daniken's conjecture that aliens visited this planet 4000 years ago. It was they who planned and executed such colossal projects as the pyramids of Egypt, the Aztec and Mayan temples and the Nazca drawings of Peru. All of these feats were obviously done on too grand a scale for non-Europeans to have accomplished them. At least it was obvious to Von Daniken. Add that to the thinking of the 1960s, where it seemed perfectly reasonable to define a student whose background differred from that of the majority as "culturally deprived." It is precisely the type of thinking which those examples illustrate, that any effort toward understanding the multicultural aspect of mathematics, and using those notions in the education of our youth, must face headon.

Where should teachers learn about the multicultural aspect of the mathematics they are teaching? What should they learn ? What effect should this knowledge have on their classroom behavior? These are the questions which should be addressed, albeit briefly, in this paper.

Where should teachers learn about these topics?

For those who are involved in preparation of teachers, pre-service education is the best opportunity to introduce a multicultural perspective to school mathematics. Those who are involved in the staff development of currently employed teachers can reasonably assume the the topic has not been adequately addressed, if at all. It should therefore also become part of the responsibility of in-service educators. "Where?" is an easy question to answer...anywhere they can.

What topics should they learn about?

The answer to this differs with the level of mathematical expertise the teacher

brings to the learning situation. A prospective elementary teacher, who has had little mathematics experience since a course or two in high school, provides the pre-service instructor with ample opportunity for multicultural infusion in a methods course. Even with a mathematics-rich background, a prospective or practicing middle or high school teacher can be further enriched by recently published information about the history and cultures which produced the mathematics taught in today's schools.

The important ingredient is a committment to inclusion. If an in-service instructor believes that mathematics is a set of culture-free procedures to be taught, learned and utilized, then this broadening of the meanings of school mathematics will go nowhere. If a methods professor has the belief that mathematics is a whole world activity to which many social groups have made contributions, then this belief will pervade the class. The history of mathematics, often assumed to be one centered in Greece and Rome (with some grudging references to the Egyptians) is a fertile area for multicultural mathematics. Books such as Africa Counts, by Claudia Zaslavsky, Ethnomathematics, by Marcia Asher and African and African-American Contributions to Mathematics by Beatrice Lumpkin can give an instructor important baseline information on which to construct some multicultural activities within the context of the course. It is encouraging to note that Ms. Lumpkin's work, done in support of the Portland (OR) Public School District's effort in this area, will soon be joined by a companion work by Dr. Luis Ortiz-Franco, tentatively titled Latinos and Mathematics.

It would be unthinkable to present a paper, anywhere in the world, about mathematics education in the United States in the early 1990s, without reference to the National Council of Teachers of Mathematics Standards. These two works have provoked much discussion and a set the stage for a great deal of effort on the part of local committees, statewide policymakers and the national media. It is certainly reasonable to assume that discussion of the Standards would come up in any in-service or pre-service course in mathematics education. While the first book, Curriculum and Evaluation Standard for School Mathematics, does not directly encourage the effort toward multiculturalism, it does indirectly help the cause, by suggesting the standards of Mathematics as Communication and Mathematical Connections at all levels of school mathematics. Both of these areas are ripe with opportunity for inclusion of the cultural aspects of math. The primacy of problem solving is unmistakable in this work. Each level's list of standards begins with Mathematics as Problems Solving. Certainly any math program, designed with problem solving at its core would offer opportunity for multicultural work by posing problems from many cultures, by using settings and which highlight the many social groups which make up our varied history.

The second Standards work, Professional Standards for Teaching Mathematics, which Professor Lindquist outlined for us so well in the earlier session, directly reminds the reader, that mathematics is an endeavor which has been influenced by many social groups. Mathematics teaching which acknowledges that fact is

encouraged. In the section labeled "Worthwhile Mathematical Tasks," the following sentences appear:

Tasks should foster students' sense that mathematics is a changing and evolving domain, one in which ideas grow and develop over time and to which many cultural groups have contributed. Drawing on the history of mathematics can help teachers to portray this idea...

A good methods class supports and encourages the use of games in a math classroom, either as drill generators, or as means to practice problem-solving, strategy type behavior. An interest in historical games, particularly those which originated in other cultures, has created a market for such products. When a market is created, the products to feed that market cannot be too far behind. Klutz Press, which many of us in the United States know from their attempts to teach us to juggle or to play harmonica (including the juggling balls or the harmonica with the books), has put out a compendium of games called The Book of Classic Board Games, which comes with two colors of pebbles and a pair of dice. Other games, with historical references can be purchased in museum shops or through catalogs.

If the introduction to multicultural mathematics is through an in-service education offering, it can take any of the forms listed above, but it must further add the element of local relevance to its course outline. Usually, the disaggregated data of an ethnically diverse district can be relevance enough to convince the unconvinced. In a district where most students are of European American backgrounds, the economic and social data of the futurists, should be enough to point out the need to understand all groups, as our students will surely be called on to interact with a more diverse population than has our generation. In a district where "minority students" actually constitute a majority, special care must be taken to ensure that "mathematics" does not mean "mathematics from a European perspective."

What should it mean in the classrooms?

Teachers are, for the most part, good, right-thinking individuals, who want to do best by their students. Most of us, when confronted with new information about the subjects we teach, will sort it out by its importance and either integrate it into our behavior or not, depending on where it falls on our value scale. The purpose of this paper is to attempt to convince any reader, involved in teacher education, that by teachers understanding the multicultural nature of the mathematics they teach, and by incorporating references to that multiculturalism in their classroom behavior, that their students, no matter what their own ethnic or social group, will have a better rounded appreciation for mathematics and for the groups who have added to its current state.

If this paper can spark some interest so that some more research will be done in this area, then the readers will attempt to do the same with the current or prospective teachers with whom they work. If successful, the teachers so influenced will

occasionally introduce a topics such as counting by twos, with a Liberian folktale. They will practice arithmetic skills with magic squares, explained as both Oriental and African in origin. They will develop students' visualization skills by use of Tangrams and Origami. They will note the similarity of the sand drawings of the Bushoong tribe to Euler's Konigsberg Bridge problem, as they begin to study network theory. They will point out the value of the round houses of some cultures, as they compare areas with perimeters and try to maximize. They will note the influence of Islamic and Native American art on the geometry we teach. In short, they will do what they have always done, regarding the basic content of school mathematics, but more completely, as they will do it with a renewed respect for the many social groups which have contributed to that mathematics. This respect and the information which engenders it will be passed on by teachers, sometimes by careful planning, sometimes by serendipitous opportunities, to the students in their care. The respect for all groups with whom the students come in contact, cannot help but be enhanced when they understand more about the heritage which preceded them. The self respect of the students who are descendent from these recently noted groups can be enhanced by these activities as well, and just as we have done over the past fifteen or twenty years with gender issues, we may well see an increase in participation and achievement of students from traditionally underrepresented groups in science and mathematics.